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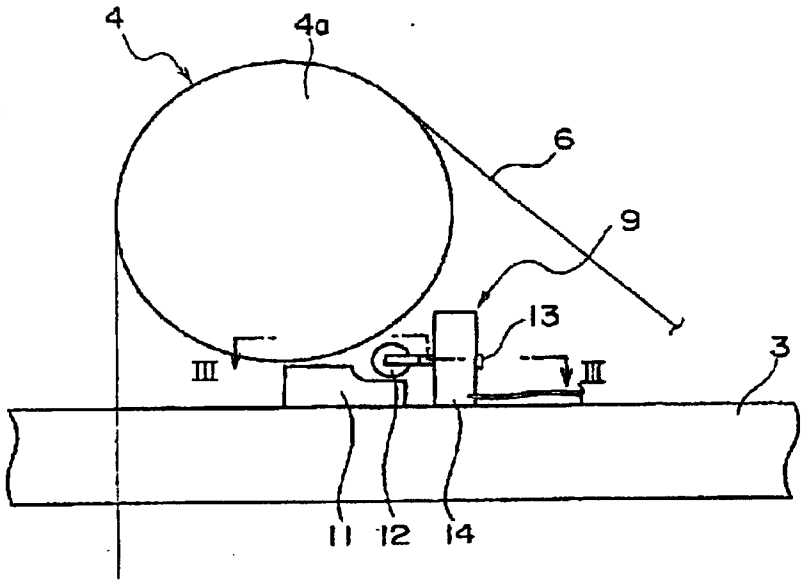
(54) NOTBREMSEINRICHTUNG FšR AUFZUG
EMERGENCY BRAKE DEVICE OF ELEVATOR
DISPOSITIF DE FREIN D'URGENCE POUR ASCENSEUR

(57) Abstract:
In an emergency brake apparatus for an elevator, when a car is ascending at a speed greater than a predetermined speed, a roller fits in between a guide body and a sheave, to thereby brake the rotation of the sheave. The roller reciprocates between a braking position and a release position along the guide body. Further, the roller is biased toward the braking position with a biasing member. The roller is normally held at the release position against the biasing member by a holding member.

FIG. 2



명세서

Technical Field

The present invention relates to an emergency brake apparatus for an elevator, which stops the ascent of an elevator car when the car is ascending at an abnormal speed.

Background Art

In an elevator, in the case where a brake apparatus of a hoisting machine has broken down, for example, where the weight of a counterweight is greater than that of a car, there is a possibility that the car will ascend at an acceleration proportional to the difference in weight of the car and the counterweight, and that the acceleration will reach abnormal speeds exceeding rated speed.

Up to now, as measures for cars ascending at abnormal speeds, methods in which devices such as speed governors and safeties are installed on a counterweight side or where rope brakes that directly grip a main rope is installed are known. However, these methods have had problems in that it is necessary to secure a sufficient space for the installation of the devices, there is a fear of the guide rails or main rope being damaged, and the apparatus structure is complicated, which leads to high cost.

Further, for example, in JP 5-193860 A, a brake apparatus is disclosed in

which a wedge-shaped braking member is pushed in between a sheave and a peripheral member thereof, whereby a main rope is held between the sheave and the braking member. In this structure, however, there is a time lag from the start of operation until generation of braking force, and thus, the ascending speed of a car increases in just that amount of time.

Disclosure of the Invention

The present invention has been made to solve the above-mentioned problems, and an object of the present invention is to obtain an emergency brake apparatus for an elevator which can promptly generate braking force and can safely stop a car with a simple and compact structure when the car is ascending at an abnormal speed.

To this end, according to one aspect of the present invention, there is provided an emergency brake apparatus for an elevator, which is provided in the elevator including a rotatable sheave disposed in an upper portion of a hoistway, a main rope wound around the sheave, and a car and a counterweight which are suspended from the main rope, for stopping the car when the car is ascending at a speed greater than a predetermined speed, the apparatus comprising: a guide body facing an outer circumferential surface of the sheave; a roller capable of reciprocating along the guide body between a braking position where the roller fits in between the guide body and the sheave and a release position where the roller is separated from the sheave; biasing means for biasing the roller toward the braking position; and holding means for holding the roller at the release position against the biasing means and for releasing the holding of the roller when the car is ascending at a speed greater than the predetermined speed.

According to another aspect of the present invention, there is provided an emergency brake apparatus for an elevator, which is provided in the elevator including a rotatable sheave disposed in an upper portion of a hoistway, a main rope wound around the sheave, and a car and a counterweight which are suspended from the main rope, for stopping the car when the car is ascending at a speed greater than a predetermined speed, the apparatus comprising: a disk which is arranged coaxially with the sheave and is in frictional-contact with the sheave, the disk being rotated together with the sheave; a guide body facing an outer circumferential surface of the disk; a roller capable of reciprocating along the guide body between a braking position where the roller fits in between the guide body and the disk and a release position where the roller is separated from the disk; biasing means for biasing the roller toward the braking position; and holding means for holding the roller at the release position against the biasing means and for releasing the holding of the roller

when the car is ascending at a speed greater than the predetermined speed.

Brief Description of the Drawings

Fig. 1 is a structural diagram showing an elevator having an emergency brake apparatus in accordance with Embodiment 1 of the present invention;

Fig. 2 is a structural diagram in which a main part in Fig. 1 is enlarged;

Fig. 3 is a cross-sectional view taken along a line III-III in Fig. 2;

Fig. 4 is a cross-sectional view taken along a line IV-IV in Fig. 3;

Fig. 5 is a front view showing a roller in Fig. 2;

Fig. 6 is a side view showing the roller in Fig. 5;

Fig. 7 is a cross-sectional view of an emergency brake apparatus in accordance with Embodiment 2 of the present invention; and

Fig. 8 is a cross-sectional view taken along a line VIII-VIII in Fig. 7.

Best Mode for Carrying Out the Invention

Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawings.

Embodiment 1

Fig. 1 is a structural diagram showing an elevator having an emergency brake apparatus in accordance with Embodiment 1 of the present invention. Fig. 2 is a structural diagram in which a main part in Fig. 1 is enlarged. Fig. 3 is a cross-sectional view taken along a line III-III in Fig. 2. Fig. 4 is a cross-sectional view taken along a line IV-IV in Fig. 3.

In the figures, an upper portion of a hoistway 1 is provided with a machine room 2. In the machine room 2, a machine base 3 is installed. A hoisting machine 4 and a deflector wheel 5 are mounted to the machine base 3. A main rope 6 is wound around a driving sheave 4a of the hoisting machine 4 and the deflector wheel 5. A car 7 is suspended from one end portion of the main rope 6 . A counterweight 8 is suspended from the other end portion of the main rope 6.

On the machine base 3, there is installed an emergency brake apparatus 9 which brakes the driving sheave 4a to stop the car 7 when the car 7 ascends at a speed greater than a predetermined speed. The emergency brake apparatus 9 has: a guide body 11 opposed to an outer circumferential surface of the driving sheave 4a; a roller 12 that can reciprocate along the guide body 11; a plunger 13 connected with the roller 12; a solenoid coil 14 as a holding

means that surrounds the plunger 13; and a spring 15 as a biasing means that is arranged between the plunger 13 and the solenoid coil 14.

The roller 12 is reciprocated between a braking position (broken line in Fig. 4) where the roller 12 fits in between the guide body 11 and the driving sheave 4a and a release position (solid line in Fig. 4) where the roller 12 is separated from the driving sheave 4a. The spring 15 biases the roller 12 toward the braking position.

The solenoid coil 14 is energized to attract the plunger 13 so as to hold the roller 12 at the release position against the spring 15. Further, when the car 7 ascends at a speed greater than a predetermined speed, energization to the solenoid coil 14 is interrupted, and the attraction to the plunger 13 is released.

Fig. 5 is a front view showing the roller in Fig. 2, and Fig. 6 is a side view showing the roller in Fig. 5. The outer circumferential surface of the roller 12 is subjected to surface roughening, whereby the friction coefficient is raised. Thus, sufficient braking force to the driving sheave 4a is secured.

Next, the operation is described. Traveling speed of the car 7 is always detected by, for example, an encoder (not shown) or the like which is provided in the hoisting machine 4. If the traveling speed of the car 7 is normal, the roller 12 is held at the release position by electromagnetic force of the solenoid coil 14.

However, when the ascent speed of the car 7 exceeds a rated speed to reach a predetermined speed for some reason, energization to the solenoid coil 14 is interrupted, and the roller 12 is moved to the braking position by the urging force of the spring 15. At this time, since the car 7 is ascending, and the driving sheave 4a rotates in a clockwise direction in Fig. 4, the roller 12 fits in between the guide body 11 and the driving sheave 4a. Thus, the rotation of the driving sheave 4a is promptly stopped.

With the above emergency brake apparatus 9, in the case where the car 7 ascends at an abnormal speed, braking force can be generated promptly with a simple and compact structure, and the car 7 can be stopped safely.

Here, the abnormal speed at the time of ascent is accelerated gently by the difference in weight between the car 7 and the counterweight 8, or the like, different from the time of descent. Therefore, if a set speed is set low, the car 7 can be stopped before it reaches high speed. Thus, it is possible to use the rapid type emergency brake apparatus 9, and the structure can be made simple and compact.

Further, the emergency brake apparatus 9 can be operated when the car 7 reaches a floor and stops, whereby the car 7 can be prevented from ascending

due to trouble in the brake apparatus (not shown) of the hoisting machine 4, or the like while waiting at a floor.

Furthermore, the brake apparatus of the hoisting machine 4 and the emergency brake apparatus 9 serve as double brakes. Thus, when the counterweight 8 weighs more than the car 7 (in general, the counterweight 8 is weighs more when there is no load in the car 7), the emergency brake apparatus 9 can be operated while the brake apparatus of the hoisting machine 4 is disassembled to conduct maintenance work. Accordingly, maintenance work can be facilitated.

Embodiment 2

Next, Fig. 7 is a cross-sectional view of an emergency brake apparatus in accordance with Embodiment 2 of the present invention, and Fig. 8 is a cross-sectional view taken along a line VIII-VIII in Fig. 7. In the figures, a ring-shaped disk 16 is in frictional-contact with an end surface of a driving sheave 4a. The disk 16 is arranged coaxially with the driving sheave 4a, and is rotated with the driving sheave 4a. Further, the disk 16 is sandwiched between a ring-shaped pressure plate 17 and the driving sheave 4a.

The end surface of the driving sheave 4a is threadedly attached with a plurality of bolts 18 bored through the pressure plate 17. A spring 19, which pushes the disk 16 against the driving sheave 4a through the pressure plate 17, is provided between the head portion of each of the bolts 18 and the pressure plate 17. The frictional force between the disk 16 and the driving sheave 4a is adjusted in accordance with the amount of tightening of the bolts 18.

An emergency brake apparatus 20 in Embodiment 2 has a guide body 11, a roller 12, a plunger 13, a solenoid coil 14, a spring 15, the disk 16, the pressure plate 17, the bolts 18, and the spring 19. Other structures of the apparatus are identical with those in Embodiment 1.

In the above emergency brake apparatus 20, the roller 12 is pushed in between the disk 16 and the guide body 11 during the operation, and the rotation of the disk 16 is promptly stopped. However, since the disk 16 is in frictional-contact with the driving sheave 4a, the driving sheave 4a is not stopped promptly, receives braking force in accordance with frictional force, and is decelerated to thereby come to a stop.

Accordingly, even where the ascending speed of a car 7 reaches a high speed that exceeds an allowable speed at which the car may be promptly stopped, the car 7 can be stopped safely with a constant braking force.

Further, in Embodiments 1 and 2, the roller 12 is arranged such that the rotation of the driving sheave 4a in the direction at the time when the car 7 ascends is stopped. In addition to this, there may be added a brake apparatus

having a roller that stops the rotation of the driving sheave 4a in the direction when the car 7 is descending.

Thus, the car 7 can also be prevented from descending due to the trouble in the brake apparatus of the hoisting machine 4, or the like while the car 7 touches the floor. Further, irrespective of the weight balance between the car 7 and the counterweight 8, the rotation of the driving sheave 4a in both directions is regulated, so that the brake apparatus of the hoisting machine 4 can be disassembled to conduct maintenance work. Thus, maintenance work can be facilitated.

Further, although an apparatus for braking the rotation of the driving sheave 4a which is a sheave is shown in Embodiments 1 and 2, it is possible to utilize an emergency brake apparatus for the deflector wheel 5 as long as the frictional force between the deflector wheel 5 which is also a sheave and the main rope 6 is sufficiently high, and the ascent of the car 7 can be stopped by braking the deflector wheel 5.

Furthermore, although in Embodiments 1 and 2, the solenoid coil 14 is shown as the holding means, a holding mechanism for mechanically holding and release the roller 12 at the release position may also be use, for example.

(57) 청구의 범위

An emergency brake apparatus for an elevator, which is provided in the elevator including a rotatable sheave disposed in an upper portion of a hoistway, a main rope wound around said sheave, and a car and a counterweight which are suspended from said main rope, for stopping said car when said car is ascending at a speed greater than a predetermined speed, said apparatus comprising:a guide body facing an outer circumferential surface of said sheave;

a roller capable of reciprocating along said guide body between a braking position where said roller fits in between said guide body and said sheave and a release position where said roller is separated from said sheave;

biasing means for biasing said roller toward said braking position; and

holding means for holding said roller at said release position against said biasing means and for releasing the holding of said roller when said car is ascending at a speed greater than the predetermined speed.

An emergency brake apparatus for an elevator, which is provided in the elevator including a rotatable sheave disposed in an upper portion of a hoistway, a main rope wound around said sheave, and a car and a

counterweight which are suspended from said main rope, for stopping said car when said car is ascending at a speed greater than a predetermined speed, said apparatus comprising:a disk which is arranged coaxially with said sheave and is in frictional-contact with said sheave, said disk being rotated together with said sheave;

a guide body facing an outer circumferential surface of said disk;

a roller capable of reciprocating along said guide body between a braking position where said roller fits in between said guide body and said disk and a release position where said roller is separated from said disk;

biasing means for biasing said roller toward said braking position; and

holding means for holding said roller at said release position against said biasing means and for releasing the holding of said roller when said car is ascending at a speed greater than the predetermined speed.

The emergency brake apparatus for an elevator according to claim 2, further comprising bolts threadedly attached to said sheave and springs provided in between said sheave and said bolts, for pushing the disk against said sheave, wherein a frictional force between said disk and said sheave is adjusted by the amount of tightening of said bolts to said sheave.

The emergency brake apparatus for an elevator according to any one of claims 1 to 3, wherein a plunger is connected with said roller; said holding means is a solenoid coil that attracts said plunger; and said biasing means is a spring arranged between said plunger and said solenoid coil.

The emergency brake apparatus for an elevator according to any one of claims 1 to 4, wherein said sheave is a driving sheave provided in a hoisting machine that causes said car and said counterweight to ascend and descend.

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FIG. 1

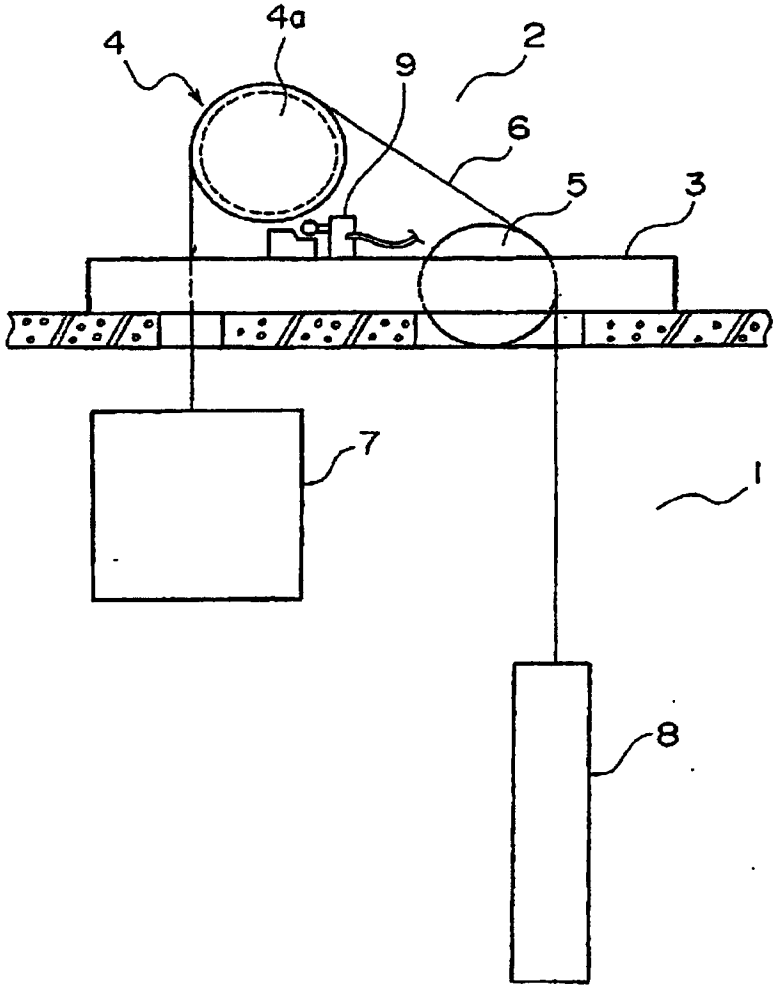


FIG. 2

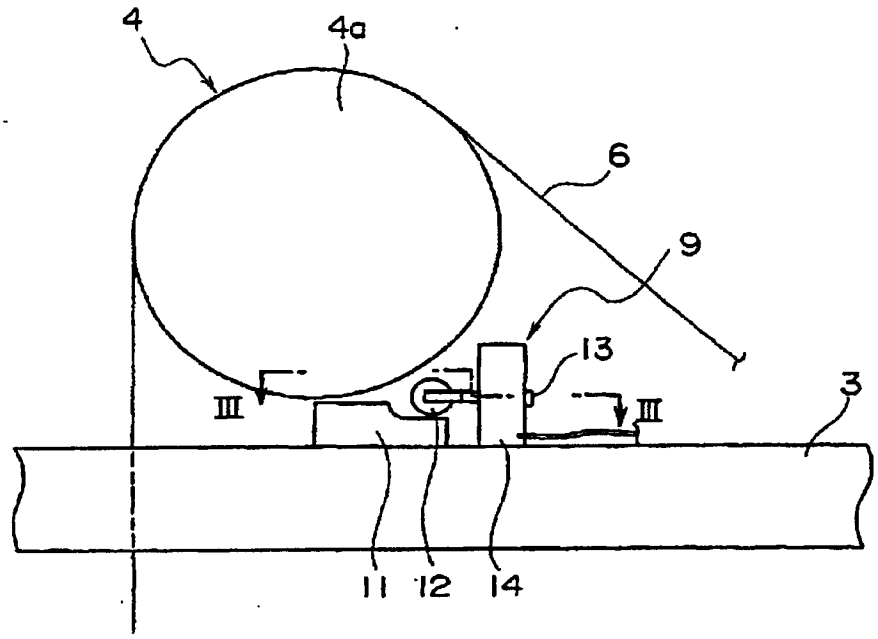


FIG. 3

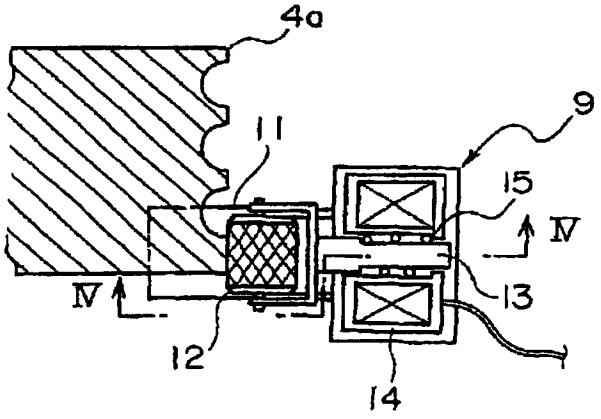


FIG. 4

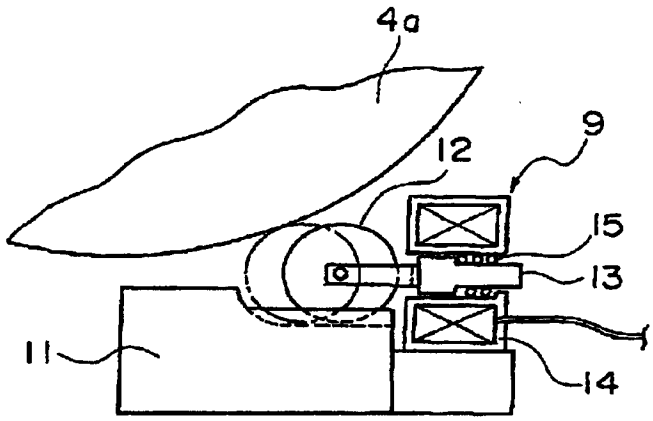


FIG. 5

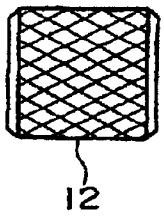


FIG. 6

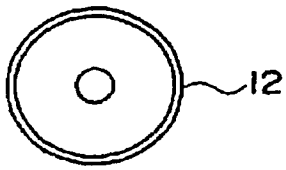


FIG. 7

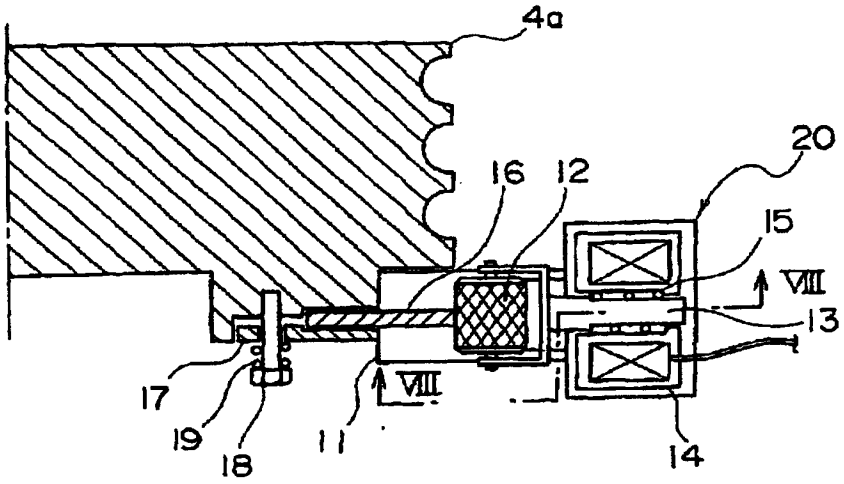
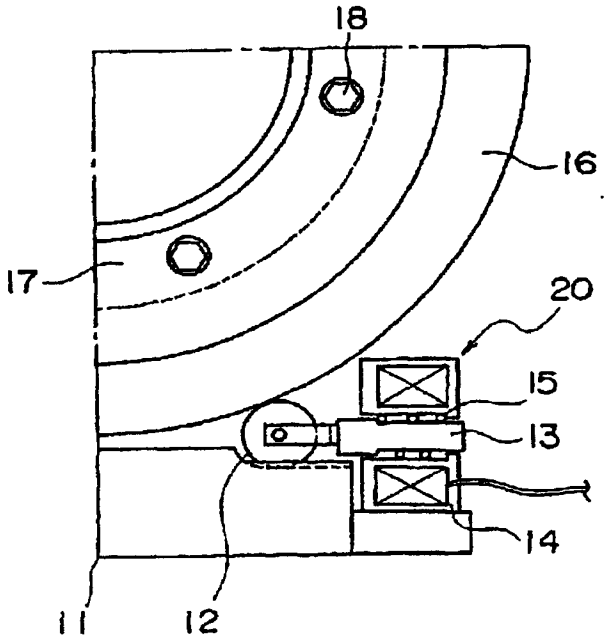


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/09424

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B5/02, B66B5/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] B66B5/00-5/28, B65B11/08, F16D49/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2001
Kokai Jitsuyo Shinan Koho 1971-2001 Jitsuyo Shinan Toroku Koho 1996-2001

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A Y	JP, 6-199483, A (Mitsubishi Electric Corporation), 19 July, 1994 (19.07.94), Par. Nos.[0016]-[0020] Par. No.[0026]; Fig.4 (Family: none)	1-2,4-5 3 5
Y A	US, 4333549, A (Otis Elevator Company), 08 June, 1982 (08.06.82), Column 2, lines 18 to 25; Fig. 2 (Family: none)	1-2,4-5 3
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.53561/1983 (Laid-open No.159675/1984) (Mitsubishi Electric Corporation), 26 October, 1984 (26.10.84), page 1, line 16 to page 2, line 15 (Family: none)	1-2,4-5 3
Y A	US, 4977982, A (Otis Elevator Company), 18 December, 1990 (18.12.90), Column 3, lines 19 to 27, 43 to 50; Figs. 2, 3, 5 (Family: none)	2,4-5 3

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 April, 2001 (09.04.01)	24 April, 2001 (24.04.01)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/09424

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP, 35-12338, Y1 (Saburo AZAI), 06 June, 1960 (06.06.60), page 1, left column, line 20 to right column, line 3 (Family: none)	2,4-5 3

Form PCT/ISA/210 (continuation of second sheet) (July 1992)